Linux Part I

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## PART I (Getting Started)

CHAPTER 1
Get started (just important concepts)

Introduction to Linux OS

Linux is a community of open-source Unix like operating systems that are based on the Linux Kernel. It was initially released by **Linus Torvalds** on September 17, 1991. It is a free and open-source operating system and the source code can be modified and distributed to anyone commercially or noncommercially under the GNU General Public License.

Initially, Linux was created for personal computers and gradually it was used in other machines like servers, mainframe computers, supercomputers, etc. Nowadays, Linux is also used in embedded systems like routers, automation controls, televisions, digital video recorders, video game consoles, smartwatches, etc. The biggest success of Linux is Android(operating system) it is based on the Linux kernel that is running on smartphones and tablets. Due to android Linux has the largest installed base of all general-purpose operating systems. Linux is generally packaged in a Linux distribution.

Linux architecture
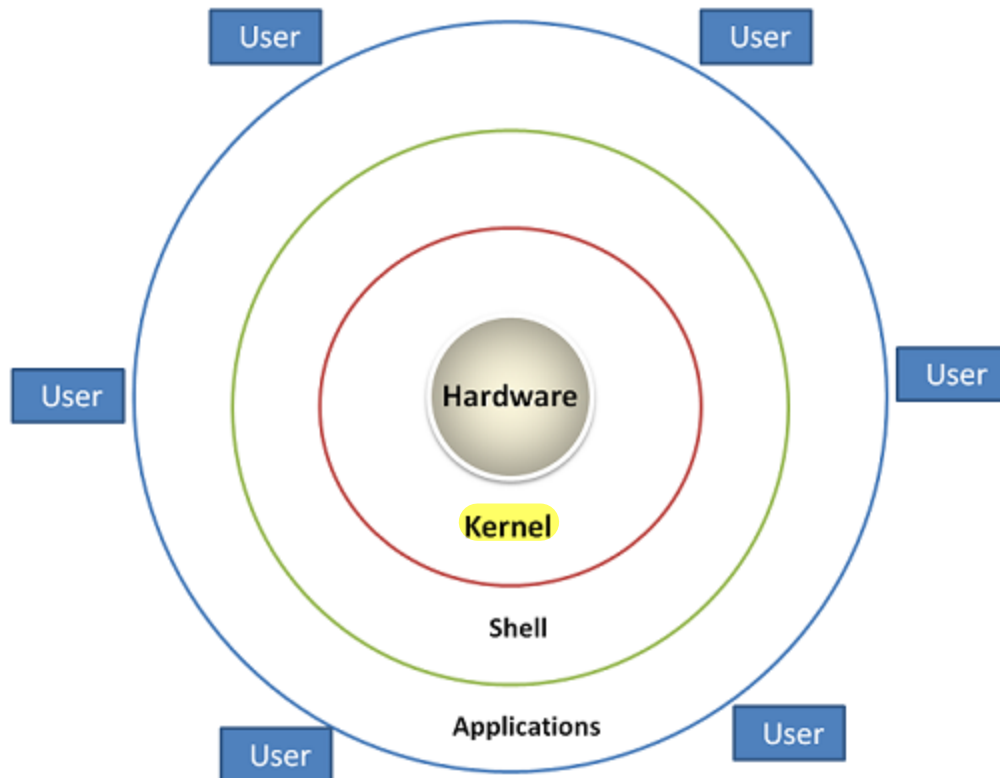
Linux System Architecture

Linux Kernel

The main purpose of a computer is to run a ***predefined sequence of instructions***, known as a **program**. A program under execution is often referred to as a **process**. Now, most special purpose computers are meant to run a single process, but in a sophisticated system such a general purpose computer, are intended to run many processes simulteneously. Any kind of process requires hardware resources such are Memory, Processor time, Storage space, etc.

In a General Purpose Computer running many processes simulteneously, we need a middle layer to manage the distribution of the hardware resources of the computer efficiently and fairly among all the various processes running on the computer. This

middle layer is referred to as the **kernel**. Basically the kernel virtualizes the common hardware resources of the computer to provide each process with its own virtual resources. This makes the process seem as it is the sole process running on the machine. The kernel is also responsible for preventing and mitigating conflicts between different processes.

The **Core Subsystems** of the **Linux Kernel** are as follows:

1. The Process Scheduler
2. The Memory Management Unit (MMU)
3. The Virtual File System (VFS)
4. The Networking Unit
5. Inter-Process Communication Unit

- **The Process Scheduler:** This kernel subsystem is responsible for fairly distributing the CPU time among all the processes running on the system simulteneously.

- **The Memory Management Unit:** This kernel sub-unit is responsible for proper distribution of the memory resources among the various processes running on the system. The MMU does more than just simply provide separate virtual address spaces for each of the processes.

- **The Virtual File System:** This subsystem is responsible for providing a unified interface to access stored data across different filesystems and physical storage media.

- **The Linux Kernel networking unit:** processes incoming packets arriving at Layer 2 to the network layer and then passes for local delivery to the transport layer protocols listening to TCP or UDP sockets.

- **Inter-process communication (IPC):** is a mechanism that allows processes to communicate with each other and synchronize their actions. The communication between these processes can be seen as a method of co-operation between them.

Processes can communicate with each other through both: Shared Memory. Message passing.

Different types of the kernel are:

- Monolithic Kernel

- Hybrid kernels

- Exo kernels

- Micro kernels

System Library: Is the special types of functions that are used to implement the functionality of the operating system.

Shell: A Unix shell is a command-line interpreter or shell that provides a command line user interface for Unix-like operating systems. The shell is both an interactive command language and a scripting language, and is used by the operating system to control the execution of the system using shell scripts.

Hardware Layer: This layer consists all peripheral devices like RAM/ HDD/ CPU etc.

System Utility: It provides the functionalities of an operating system to the user.

GNU

Linux is normally used in combination with the GNU operating system: the whole system is basically GNU with Linux added, or GNU/Linux. All the so-called "Linux" distributions are really distributions of GNU/Linux.

Linux Distribution

Linux distribution is an operating system that is made up of a collection of software based on Linux kernel or you can say distribution contains the Linux kernel and supporting libraries and software. And you can get Linux based operating system by downloading one of the Linux distributions and these distributions are available for different types of devices like embedded devices, personal computers, etc. Around **600 + Linux Distributions** are available and some of the popular Linux distributions are:

- MX Linux

- Manjaro

- Linux Mint

- elementary

- Ubuntu

- Debian

- Solus

- **Fedora** **(We'll be using this in this complete book)**

- openSUSE

- Deepin

We'll be using FEDORA Distro in this course book as mentioned Above

Administrative concepts

Offering Administrative utilities:

In Linux, hundreds (perhaps thousands) of commands and graphical windows are available to do such things as add users, manage disks, monitor the network, install software, and generally secure and manage your

computer. Web UI tools, such as **Cockpit**, have lowered the bar for doing complex administrative tasks.

Starting up services:

system and network services, processes called daemon processes run in the background, waiting for requests to come in. Many types of services run in Linux. Linux provides different ways of starting and stopping these services. Popular server features include web, mail,
database, printer, file, DNS, and DHCP servers.

Clustering:

Linux cluster is **a group of Linux computers or nodes, storage devices that work together and are managed as a single system**
. In a traditional clustering configuration, two nodes are connected to shared storage

Virtualization:

To the outside world, each of those virtual guests appears as a separate computer. **KVM** and **Xen** are two technologies in Linux for creating virtual hosts.

Specialized storage:

Instead of just storing data on the computer's hard disk, you can store it on many specialized local and networked storage interfaces that are available in Linux. Shared storage devices available in Linux include iSCSI, Fibre

Channel, and Infiniband. Entire open source storage platforms include projects such as **Ceph** (https://ceph.io) and **GlusterFS** (https://www.gluster.org).